

WE CLAIM:

1. A method of controlling microbial pathogens on living plant tissue comprising treating said plant tissue with a dilute aqueous solution comprising an effective amount of one or more aliphatic C₂-C₁₂ peroxy-carboxylic acids, and an aliphatic C₃-C₁₂ carboxylic acid, wherein the mole ratio of aliphatic carboxylic acid to peroxy-carboxylic acid is less than about 3:1.
2. The method of claim 1 wherein the plant tissue comprises a seed.
3. The method of claim 1 wherein the plant tissue comprises a tuber.
4. The method of claim 1 wherein the plant tissue comprises a growing plant.
5. The method of claim 1 wherein the plant tissue comprises a cutting.
6. The method of claim 1 wherein the plant tissue comprises rooting stock.
7. The method of claim 1, wherein the aqueous solution comprises:
 - (a) at least about 5 parts per million (ppm) of one or more aliphatic C₂-C₁₂ peroxy-carboxylic acids; and
 - (b) at least about 0.1 parts per million (ppm) of an aliphatic C₃-C₁₂ carboxylic acid.
8. The method of claim 7, wherein the peroxy-carboxylic acid is peroxyacetic acid, peroxyoctanoic acid, perglycolic acid, permalonic acid, perlactic acid, peroctanoic acid, perhydroxycaproic acid, perhydroxycaprylic acid, mono-methyl peradipate, mono-methyl persuccinate, mono-methyl perglutarate, mono-ethyl peradipate, mono-ethyl persuccinate, mono-ethyl perglutarate, mono-isobutyl peradipate, mono-isobutyl persuccinate, mono-isobutyl perglutarate, or a mixture thereof.
9. The method of claim 7, wherein the aliphatic carboxylic acid is propionic acid, hexanoic acid, heptanoic acid, octanoic acid, decanoic acid, dodecanoic acid or a mixture thereof.
10. The method of claim 1, wherein the aqueous solution comprises:
 - (a) at least about 4 parts per million (ppm) of a C₂-C₇ peroxy-carboxylic acid;
 - (b) at least about 1 part per million (ppm) of an aliphatic C₈-C₁₂ peroxy-carboxylic acid; and

(c) at least 0.1 parts per million (ppm) of an aliphatic C₃-C₁₂ carboxylic acid.

11. The method of claim 10, wherein said C₂-C₇ peroxycarboxylic acid is peroxyacetic acid, mono-methyl persuccinate, mono-methyl perglutarate, mono-methyl peradipate, mono-ethyl persuccinate, mono-ethyl perglutarate, or a mixture thereof.

12. The method of claim 10 wherein said C₈-C₁₂ aliphatic peroxycarboxylic acid is peroxyoctanoic acid, mono-ethyl peradipate, mono-isobutyl peradipate, mono-isobutyl persuccinate, mono-isobutyl perglutarate, or a mixture thereof.

13. A method for controlling microbial pathogens on living plant tissue comprising:

(a) diluting in an aqueous liquid a concentrate comprising:

(i) about 0.1 to 25 wt-% of one or more aliphatic C₂-C₁₂ peroxycarboxylic acids; and

(ii) about 0.01 to 30 wt-% of an aliphatic C₃-C₁₂ carboxylic acid to form a solution; and

(b) contacting said plant tissue with said solution, wherein the mole ratio of aliphatic carboxylic acid to peroxycarboxylic acid is less than about 3:1.

14. The process of claim 13, wherein the C₂-C₁₂ peroxycarboxylic acid is peroxyacetic acid, peroxyoctanoic acid, mono-methyl persuccinate, mono-methyl perglutarate, mono-methyl peradipate, mono-ethyl persuccinate, mono-ethyl perglutarate, mono-ethyl peradipate, mono-isobutyl peradipate, mono-isobutyl persuccinate, mono-isobutyl perglutarate, or a mixture thereof.

15. The process of claim 13, wherein the aliphatic carboxylic acid is propionic acid, hexanoic acid, heptanoic acid, octanoic acid, decanoic acid, dodecanoic acid or a mixture thereof.

16. The process of claim 13, wherein the concentrate further comprises about 1 to 15 wt-% of a hydrotrope.

17. The process of claim 16, wherein the hydrotrope is n-octanesulfonate, a xylene sulfonate, an alkylbenzene sulfonate, an alkyl naphthalene sulfonate, an amine oxide, an alcohol ethoxylate, or a mixture thereof.

18. The process of claim 13, wherein the concentrate further comprises a chelating agent.
19. The process of claim 18, wherein the chelating agent is 1-hydroxyethylidene-1,1-diphosphonic acid.
- 5 20. The method of claim 13, wherein the concentrate comprises:
- (a) about 0.1 to 25 wt-% of a C₂-C₇ peroxycarboxylic acid;
 - (b) about 0.1 to 20 wt-% of a C₈-C₁₂ aliphatic peroxycarboxylic acid;
- and
- (c) about 0.01 to 30 wt-% of an aliphatic C₃-C₁₂ carboxylic acid.
- 10 21. The method of claim 20, wherein the C₂-C₇ peroxycarboxylic acid is peroxyacetic acid, mono-methyl persuccinate, mono-methyl perglutarate, mono-methyl peradipate, mono-ethyl persuccinate, mono-ethyl perglutarate, or a mixture thereof.
22. The method of claim 20, wherein the C₈-C₁₂ peroxycarboxylic acid is peroxyoctanoic acid, mono-ethyl peradipate, mono-isobutyl peradipate, mono-isobutyl persuccinate, mono-isobutyl perglutarate, or a mixture thereof.
- 15 23. A method for controlling microbial pathogens on living plant tissue comprising:
- (a) diluting in an aqueous liquid a concentrate comprising:
 - (i) about 1 to 20 wt-% of a C₂-C₇ peroxycarboxylic acid; and
 - 20 (ii) about 0.1 to 20 wt-% of an aliphatic C₈-C₁₂ peroxycarboxylic acid;
 - (iii) about 5 to 40 wt-% of a C₂-C₇ carboxylic acid;
 - (iv) about 1 to 20 wt-% of an aliphatic C₈-C₁₂ carboxylic acid;
 - (v) about 1 to 30 wt-% of hydrogen peroxide; and
 - 25 (vi) about 0.01 to 30 wt-% of another C₃-C₁₂ aliphatic carboxylic acid to form a solution, wherein the mole ratio of aliphatic carboxylic acid to peroxycarboxylic acid is less than about 3:1; and
 - (b) contacting said plant tissue with said solution.
24. The process of claim 23, wherein the C₂-C₇ peroxycarboxylic acid is
- 30 peroxyacetic acid, mono-methyl persuccinate, mono-methyl perglutarate, mono-methyl peradipate, mono-ethyl persuccinate, mono-ethyl perglutarate, or a mixture thereof.

25. The process of claim 23, wherein the C₈-C₁₂ aliphatic peroxycarboxylic acid is peroxyoctanoic acid, mono-ethyl peradipate, mono-isobutyl peradipate, mono-isobutyl persuccinate, mono-isobutyl perglutarate, or a mixture thereof.
26. The process of claim 23, wherein the C₃-C₁₂ aliphatic carboxylic acid is
5 propionic acid, hexanoic acid, heptanoic acid, octanoic acid, decanoic acid, dodecanoic acid or a mixture thereof.
27. The process of claim 23, wherein the concentrate further comprises about 1 to 15 wt-% of a hydrotrope.
28. The process of claim 27, wherein the hydrotrope is n-octanesulfonate, a
10 xylene sulfonate, an alkyl benzene sulfonate, an alkyl naphthalene sulfonate, an amine oxide, an alcohol ethoxylate, or a mixture thereof.
29. The process of claim 23, wherein the concentrate further comprises a chelating agent.
30. The process of claim 29, wherein the chelating agent is 1-
15 hydroxyethylidene-1,1-diphosphonic acid.
31. A method of growing at least one plant on a hydroponic substrate in a hydroponic liquid supply medium to produce usable fruit or vegetable products with reduced microbial contamination, the method comprising:
- 20 (a) establishing growing and living plant tissue in the hydroponic substrate;
(b) contacting the living plant tissue, the hydroponic substrate and the hydroponic liquid with a dilute aqueous solution comprising an effective amount of one or more C₂-C₁₂ percarboxylic acids and an aliphatic C₃-C₁₂ carboxylic acid, wherein the mole ratio of aliphatic carboxylic acid to peroxycarboxylic acid is less than about 3:1; and
- 25 (c) harvesting an improved product.
32. The method of claim 31 wherein the percarboxylic acid is peracetic acid.
33. The method of claim 31 wherein the aliphatic carboxylic acid comprises heptanoic acid, octanoic acid, decanoic acid, dodecanoic acid or a mixture thereof.
34. The method of claim 31 wherein the percarboxylic acid comprises a mixture
30 of a C₂-C₇ and a C₈-C₁₂ aliphatic percarboxylic acid.

35. The method of claim 31 wherein the aqueous solution comprises about 4 to 100 parts per million of a C₂-C₇ percarboxylic acid and about 1 to about 100 parts per million of an aliphatic C₈-C₁₂ percarboxylic acid.

36. The method of claim 31 wherein the percarboxylic acid comprises a mixture
5 of peroxyacetic acid and peroxyoctanoic acid.

37. The method of claim 31 wherein the aqueous solution comprises about 5 to 1000 parts per million of an aliphatic C₃-C₁₂ carboxylic acid.

38. The process of claim 31 wherein the living tissue comprises a germinating seed.

10 39. The method of claim 31 wherein the living tissue comprises a growing tuber.

40. The method of claim 31 wherein the plant tissue comprises a growing dicotyledon.

15 41. The method of claim 31 wherein the plant tissue comprises a growing monocotyledonis plant.

42. The method of claim 31 wherein the living tissue comprises a plant cutting.

43. The method of claim 31 wherein the plant tissue comprises rooting stock and a graft.